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ABSTRACT

This report presents existing workforce levels, training programs and career potentials and develops staffing level projections (1976-1982) based on available information for the State of California. The study concerns itself with the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, wastewater, and energy. The format includes workforce profiles, projections, growth and career options for each of the areas investigated. Additional sections of the report outline state legislation and selected post secondary institutions with formal Environmental/Energy programs. A state profile and summary is included for cross-reference. The selected bibliography is appended in the Region IX report. This document is one in a series of 69 which presents information for each of the states, Washington, D.C., Puerto Rico, and the Virgin Islands, and national and regional summaries.

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A National Environmental/Energy Workforce Assessment



Conducted by:

National Field Research Center, Inc.

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U.S. DEPARTMENT OF HEALTH,
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SE 023 296

NATIONAL ENVIRONMENTAL/ENERGY
WORKFORCE ASSESSMENT

for

CALIFORNIA

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

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PREFACE

This study provides information on existing workforce levels, training programs, and career potentials and develops workforce projections (1976-1982) for the environmental pollution control fields of air, noise, pesticides, potable water, radiation, solid waste, wastewater, and energy conservation/conversion in the State of California. The profiles and projections contained in this report are based upon available information obtained through various state agencies. The information and data presented in this study were obtained through extensive personal interviews with professionals working in the respective fields. The personal interviews were supplemented with information collected through telephone surveys and research.

This study was conducted under the direction of the United States Environmental Protection Agency by National Field Research Center, Inc., located in Iowa City, Iowa.

FOREWORD

The materials contained in this report include information and data collected for eight individual pollution control inventories conducted for California. The format includes workforce profiles, projections and career potential for each of the areas investigated. Projections were necessarily based on best professional estimates obtained through available information. The pollution control areas considered by this study are as follows:

Air

Noise

Pesticides

Potable Water

Radiation

Solid Waste

Wastewater

Energy

National Environmental Energy
Workforce Assessment

Phase I

CALIFORNIA

State Summary

I. AIR

The California Air Resources Board is responsible for the control of vehicle emissions and for a coordinated state and local program of air pollution control. The Board is currently staffed with 405 persons: 34 administrators, 126 engineers, 2 attorneys, 41 scientists, 63 technicians, 81 other, and 58 clerical. The Board anticipates some growth during the next five years, with an average annual increase of 8 percent.

There are a total of forty-one local air pollution control boards staffed and operating in California. The boards are currently staffed with 941 persons. This number includes engineers, inspectors, attorneys, sanitarians, technicians, chemists, data processing specialists, public information specialists, pollution control specialists, meteorologists, instrumentation specialists, and others. The local air pollution control agencies predict steady but limited growth in staff requirements during the next five years, with an average annual increase of 2 percent.

Limited information is available on the private sector. There are 1,637 major installations in the state; it has been predicted that most of these installations have air pollution control components, however, no staffing estimates are available. Private industry predicts from 1 to 2 percent per annum growth during the next five years.

II. NOISE

The California Office of Noise Control maintains primary responsibility for noise pollution control and abatement regulatory functions; however, other agencies involved in noise control include the State Highway Patrol, the State Housing and Community Development Commission, the California Department of Transportation, and the Attorney General's Office.

The Office is currently staffed with five professional and two clerical positions. The professionals include three engineers, one architect, and one psychoacoustician. The Office predicts that staffing requirements for the program will approximately double by 1981, with a minimum of three professional positions.

The other agencies involved in noise control employ approximately 238 professionals. The professionals have backgrounds and experience as highway patrol officers, engineers, chemists, sanitarians, statisticians, compliance specialists, planners, engineering technicians, and aviation specialists. Growth in the agencies will be minimal during the next five years.

Within the private sector, there are approximately 175 to 200 persons involved with aspects of noise programs within the counties and municipalities. Occupations include engineers, industrial hygienists, police officers, field inspectors, and consultants. Minimal growth is anticipated in the private sector.

III. PESTICIDES

The California Department of Food and Agriculture is the principal pesticide regulatory and control unit in the state. Two administrative units within the department have pesticide related programs: the Agricultural Chemicals and Feed Division and Pesticide Residue Laboratory. The Agricultural Chemicals and Feed Division is currently staffed with 84 persons: 48 in state headquarters and 36 in district offices. Most positions are filled by persons with backgrounds in chemistry, entomology, plant pathology, agricultural education, and biology. The Pesticide Residue Laboratory is staffed with 14 chemists.

Other state agencies involved with pesticide programming include the Pesticide Investigation Laboratory, the California State Extension Service, and the Pesticide Education Coordinating Unit. These agencies employ an additional 159 persons who have some responsibility for pesticide programs. Limited growth is anticipated in these state agencies during the next five years.

In addition to the above staff, there are 192 part-time county agricultural extension specialists, 7,000 commercial applicators/operators, 700 agricultural pest control advisors, and 65,000 farmers. Substantial growth is anticipated for the private sector. Experts within the area indicate that there may be as much as 5 to 15% increase in the workforce requirements per annum during the next five years.

IV. POTABLE WATER

The Sanitary Engineering Section of the Department of Health has the administrative responsibilities for the potable water programs for the State of California. The Section is currently staffed with 68 persons: 57 professional/technical positions, 9 clerical positions, and 2 temporary workers. As a general rule, the professional have backgrounds in engineering. The staff devotes only 70 percent of their time to domestic water supply regulation. No growth is projected for the Section during the next five years.

The 53 county health departments have some responsibility for potable water programs. Workforce statistics for the departments are sketchy; however, it is estimated that each department has from one to five persons with some responsibility in water supply. No growth is projected for the next five years.

Little information is available on the private sector workforce. The Sanitary Engineering Section maintains records only on the number of certified system operators. There are 5,279 operators currently certified. A partial survey of water treatment facilities within the state revealed that the crew size and composition varied according to locality. The largest facility in the United States is the Department of Water and Power of the City of Los Angeles. The facility currently employs 10,454 persons. No growth is predicted in the private sector during the next five years.

V. RADIATION

The principal function of the Radiologic Health Section of the California Department of Health is the elimination of unnecessary and unproductive man-made radiation. The Section is currently staffed with 31 professional/technical positions and 22 clerical positions. The Section anticipates adding from five to six persons to the staff during the next five years. Three of the positions will be added to the X-ray inspection program, and two of the positions will be used to expand the X-ray licensing program.

The Bureau of Occupational and Radiation Management of the Community Health Services Agency in Los Angeles operates an environmental radiation satellite program. The program is staffed with nine professional/technical positions and three clerical positions. The Bureau predicts a maximum growth of two positions during the next five years: one radiation protection specialists and one health physicist.

Private sector workforce statistics are varied. A report published by ERDA on the nuclear related technician workforce indicated that 7,297 persons are involved in private sector occupations. In addition, the Radiologic Health Section indicates that there are approximately 156 health safety officers employed at clinics, 156 safety officers and assistants employed at academic institutions, 71 Civil Defense instructors, and an undetermined number of employees in the 805 industrial users. Statistics support a 5-10% per annum growth rate in the private sector through 1981.

VI. SOLID WASTE

The Solid Waste Management Board, the state lead agency for solid waste related programs, is currently staffed with thirty-five professional/technical positions: 9 engineers, 6 administrators, 6 solid waste specialists, 4 resource economists, 2 planners, and 8 student assistants. The majority of the professionals have training in engineering, physical science, or economics. Activities of the Board are supported through the efforts of 10 clerical employees.

The Solid Waste Management Board anticipates major growth in its staff during the coming five years. During 1977, the Board predicts a 100% increase in staff, and from 1977 to 1982, the Board estimates an annual average growth rate of 27%. This rapid growth is related to the Board's increased program responsibilities under the emerging resource recovery program and the technical assistance program to the counties.

No information is currently available on the number of employees working in the sanitary landfills, hazardous waste sites, or collection systems. Moderate growth is predicted within the private sector during the next five years. The exact amount of annual growth cannot be accurately determined. Any increase will be directly related to population growth and industrial expansion.

VII. WASTEWATER

The environmental wastewater regulatory agency for the State of California is the State Water Resources Control Board. The Board employs a total of 496 professional/technical positions and 190 clerical positions. Professional occupations include 65 administrators, 54 biologists, 278 engineers, 30 engineering technicians, 53 analysts, 15 attorneys, and 1 operations specialist. The Board expects only limited growth during the next five years, with an average annual increase of no more than 1 percent.

Other state and regional agencies involved with wastewater programs include the California Department of Fish and Games Laboratory, the Marine Bio Assay Laboratory, the San Marcos Training Center, five community colleges, and seven regional planning commissions. Cumulatively, they employ an estimated 167 persons in wastewater related programs. Minimal growth is projected through 1981.

There are approximately 735 municipal wastewater treatment plants in the state that employ an estimated 7,655 persons. This includes 4,000 operators and 3,655 others. The other category consists of administrators, chemists, and maintenance persons. During the next five years, an average annual growth of 5 percent is predicted. In addition, there are 750 individual plants in the state, 250 of which operate waste treatment facilities. The crew size in the facilities range from two to three persons. An average annual growth of from 5 to 10 percent is predicted for the industrial wastewater program.

VIII. ENERGY

The California State Energy Resources Conservation and Development Commission is the principal energy program coordinating agency for the state. The commission is staffed with a total of 573 persons including administrators, scientists, economists, lawyers, and planners. During the next five years, the commission does not anticipate any major growth in its staffing requirements.

Each of the utility companies in the state has an environmental workforce; however, complete information on the extent of this workforce is not currently available. Data were, nevertheless, collected on two of the state's major utilities: Southern California Edison Company and the Pacific Gas and Electric Company. Pacific Gas was able to identify 165 persons with direct environmental responsibilities. Sources at the company indicated that an undetermined number of persons provide additional supportive services to the environmental effort. Southern California Edison has an environmental component under its Environmental Planning Department. The Department is staffed with 21 full-time persons. Additional support is provided through a minimum of four other departments in the company. No estimate was available on the number of persons involved in environmental activities within these departments.

While the public sector workforce is predicted to remain reasonably stable, major growth is projected for the private sector during the next five years. The exact amount of growth cannot be accurately determined at present.

STATE OF CALIFORNIA - SUMMARY

National Environmental/Energy Workforce Assessment Pollution Control & Abatement Personnel Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	1346	1440	1492	1538	1585	1633	4%
NOISE ¹	238	247	247	247	247	252	1%
PESTICIDES ²	237	245	253	261	269	280	3%
POTABLE WATER ³	5347	5347	5347	5347	5347	5347	0%
RADIATION	7720	8450	9238	10100	11044	12078	9%
SOLID WASTE ⁴	35	70	76	84	91	98	27%
WASTEWATER ⁵	8151	8345	8943	9339	9738	10136	4%
ENERGY ⁶	573	573	573	573	573	573	0%
TOTALS	23647	24717	26169	27489	28894	30397	5%

¹Figures include projections for public sector only; they do not include the 175-200 private sector employees.

²These estimates do not include the estimated 192 part-time extension agricultural farm advisors, the instructional staff at commercial colleges who may become involved in pesticide training, the 7,000 commercial applicators/operators, 700 agricultural pest control advisors, 65,000 farmers, or the 18-25 seasonal employers at the Pesticide Investigation Laboratory.

³These figures include only state staff and number of certified operators. They do not include operators at municipal systems, or the employees of the 53 local health departments who have potable water related tasks.

⁴The above does not include private sector workforce statistics.

⁵The above does not include persons employed or contracted under 208 Planning in Regional Planning Commissions, the 12 professionals at the California Fish and Games Laboratory, 21 employed at the Marine Bio Assay Laboratory, 5 employees at the San Marcos Training Center, 9 instructors at community colleges, and the undetermined number of employees at the 250 industrial wastewater treatment facilities.

⁶The above includes information on the state lead agency only. The growth was calculated on a simple percentage basis.

EDUCATION

Environmental education programs are offered in numerous state universities, colleges, community colleges, and technical schools. Advanced degree programs are offered through the University of California at Berkeley, the University of California at Irvine, California State University at Sacramento, California State University at San Jose, and Stanford University.

Advanced degrees in Environmental Engineering are available through the University of California, Irvine; California State University, San Jose; and Stanford University. The University of California at Berkeley offers both masters and doctoral degrees in Sanitary Engineering. A Masters of Science in Engineering degree is awarded by the California State University, Sacramento, for course work in Civil Engineering with an environmental emphasis.

The California State Water Resources Control Board operates a comprehensive wastewater treatment training program through the San Marcos Training Center. The Center currently offers fifty courses; however, not all courses are available during a given quarter.

Wastewater and potable water operator training programs are also available through five community colleges in the state: Orange Coast, Santa Ana, Contra Costa, Sacramento City, and Sierra. Others of the 106 state community colleges offer sporadic environmental training programs; however, minimal information is currently available on these programs.

LEGISLATION

The environmental/energy legislation for California was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Quality Act of 1970

Air Pollution Control Laws

Motor Vehicle Code Air Pollution Provisions

Pollution Control Financing Authority Act

Noise Control Act of 1973

Pest Control Operations-Agricultural Code

Water Systems and Operators Law

Radiation Control Law

Hazardous Waste Law

Beverage Container Law

Solid Waste Management and Resource Recovery Act

Porter-Colgne Water Quality Control Act

Coastal Zone Conservation Act of 1972

**National Environmental Energy
Workforce Assessment**

Phase I

CALIFORNIA

State Report

STATE PROFILE

California is perhaps the state to which more superlatives apply than any other. In terms of population, economic resources, cultural attractions, and scenic wonders it is more easily compared with other nations than with other states.

With a population of over 20 million, California is the most populous state in the nation. Most of the population is urban and resides in coastal cities; foremost among these are Los Angeles, San Francisco, and San Diego. Following the discovery of gold in the state in 1848, a steady stream of immigrants has flowed into the state bringing with them a variety of racial, religious and cultural backgrounds. The state nearly doubled in population every 20 years from 1860 to 1960. California is now the home of major Chinese, Japanese, Black and Chicano populations.

The economic resources of California are vast and diversified. Its gross product is larger than any other state and, in fact, is exceeded by only five nations in the world --- the United States, Soviet Union, West Germany, France and Japan; the per capita income is larger than that of any other country.

California is the principal agricultural state in the nation. There are more than 8,000,000 acres of irrigated farmland in the state, and it ranks first in the production of grapes, tomatoes, sugar beets, strawberries, beef cattle and turkeys. One-third of the nation's canned and frozen fruits and vegetables originate in California; 80 percent of the wine consumed in the United States is produced in the state. Farms are typically large and

specialize in one or two crops resulting in what amounts to an agricultural assembly line. A nine to ten month growing season has expanded the state's agricultural production.

California has been and continues to be a leader in petroleum production although reserves are rapidly being depleted. Natural gas, cement, sand and gravel are other important mineral resources. Fisheries and forestry are other significant commercial activities; tuna is the primary catch.

The aerospace industry, aircraft plants and shipyards are other key segments of the California economy. These facilities developed during World War II and have grown and been supplemented since then by research and development funding. Film and television, tourism, and military installations are the other primary contributors to the economy.

The diversity of the California landscape represents one of the major attractions of the state. The Coastal ranges and the Sierra Nevada contain some of the highest peaks and most beautiful scenery in the country. Death Valley, redwood forests, and numerous national parks are among the state's physical features.

California's water resources have had a major impact on its economy and environment. The southern part of the state contains 60% of the population but has only 2% of the water. A complex system of dams and aqueducts moves water from the north to the south. The California State Water Project was launched in 1960 and is the largest water transfer system undertaken in history. Facilities to move an additional 1.8 billion gallons daily are still incomplete.

The coastal area of California has developed into the second most urban area in the United States. An environmental, economic, and social outgrowth

of this population is that California has the greatest concentration of motor vehicles on earth; it also has the most extensive system of multilane divided freeways. Smog and congestion have resulted from 14,000,000 registered motor vehicles and nearly 4,000 miles of freeways. Not insignificant in terms of air pollution is the San Francisco -- Los Angeles -- San Diego air corridor, the most heavily-travelled route in the country.

California state government has shown many innovations, perhaps partially due to the variety in population backgrounds. Referendum, recall and direct constitutional amendment are all a part of California's law. California is recognized as a leading state in education, health and welfare, and cultural matters.

Many developments in California's history have been innovative in such areas as life-styles, economic growth, and population expansion. As a result of these rapid changes, California has had to face and solve unique problems. It has been a leader in attempts to abate air pollution through control of motor vehicle emissions. Water projects to serve the large population have had major ecological impacts. While indications are that population growth has leveled off, California will continue to have, and solve, environmental problems.

CALIFORNIA POLLUTION CONTROL AND ABATEMENT AGENCIES

The Resources Agency constitutes California State's lead agency in pollution control regulation and abatement. It is comprised of the following departments: Conservation, Fish and Game, Navigation and Ocean Development, Parks and Recreation, Water Resources, State Water Resources Control Board, Solid Waste Management Board, the Reclamation Board, the Air Resources Board, the nine Regional Water Quality Control Boards, the Colorado River Board, and the State Lands Commission. In addition, the San Francisco Bay Conservation and Development Commission has been administratively assigned to the Resources Agency by the Governor. The Agency is headed by the Secretary, a Governor appointee, who has the power of general supervision over, and is directly responsible to the Governor for, the operations of each department and unit within the agency. The Secretary develops and reports to the Governor on legislative, budgetary and administrative programs to accomplish comprehensive, long-range, coordinated planning and policy formulation in matters of public interest related to the agency.

Of those agencies under the umbrella of the Resources Agency, the following agencies have environmentally related activities: Fish and Game, Water Resources, State Water Resources Control Board, Solid Waste Management Board, Air Resources Board, and the nine Regional Water Quality Control Boards.

Other state agencies which are involved in environmental pollution control and abatement include: California Department of Transportation,

Attorney General's Office, Office of Noise Control Pesticide Investigation Laboratory, Marine Bio Assay Laboratory, Department of Food and Agriculture, Office of Planning and Research, Department of Health, Energy Resources Conservation and Development Commission, State Highway Patrol, and the Office of Pesticide Applicator Training.

Much of the pollution control and abatement activities within the state have been decentralized. Among the regional and local agencies and organizations which have operable environmental programs are: the regional planning commissions, the county departments of health, the county building commissions, the local air pollution control districts, municipal police departments, and the municipal water and wastewater treatment facilities.

Notable priorities of current importance include 208 Planning and Construction Grants for water programs, resource recovery and solid waste management techniques for the solid waste area, and statewide inventory of sources of air pollution.

Pollution Control and Abatement Programs

I. AIR

A. Introduction

The Air Resources Board is the air pollution control agency of the State of California. The Board is responsible for the control of vehicle emissions and for a coordinated state and local program of air pollution control. The Board maintains a surveillance of air quality and statewide inventory of sources of air pollution; adopts standards and test procedures for emissions for motor vehicles; and approves motor vehicle emission control systems. The Board also reviews the regulations and programs of local agencies for the control of nonvehicular sources of air pollution, and sets and enforces regulations where local agencies fail to do so.

The first enabling legislation for air pollution control was adopted in 1947 (it allowed counties to set up control plans). In 1955, a state level agency (The Bureau of Air Sanitation) was formed to assist the counties. In 1959, the first statewide ambient air quality standards and motor vehicle emission standards were adopted. In 1969, the present Air Resources Board was formed and greater powers were allocated to the local air pollution control agencies. The basic goals of the Air Pollution Control Board include the following:

- 1) air monitoring to determine the extent to which air quality standards are met;
- 2) design and enforcement (direct or through counties) of emission control programs to attain the air quality standards where they are not met and to preserve high grade air quality in the other areas;

- 3) assisting state and local planning efforts to incorporate air quality considerations into their long range planning processes (e.g., for land use, services, etc.).

The activities of the Board include:

- 1) setting air quality standards for the state;
- 2) setting motor vehicle standards for the state;
- 3) enforcing motor vehicle standards;
- 4) maintaining the statewide air quality monitoring and source emissions inventory systems;
- 5) overseeing the operations of the local air pollution control districts;
- 6) conducting enforcement actions for the local districts when they cannot or will not do so;
- 7) administering the regulation of agricultural burning program;
- 8) administering the program for direct financial assistance to local air pollution control districts;
- 9) providing technical consultant services and assistance to local air pollution control districts;
- 10) conducting research programs focusing on land use policies and methods and techniques of control of air pollution;
- 11) designing equipment for controlling the impact of hydrocarbons from handling of gasoline.

The administration and operation of these program activities are accomplished through the seven program divisions: Administrative Services, Legal Affairs and Enforcement, Research, Stationary Source Control, Technical Services, Vehicle Emission Control and Planning.

The Board was reorganized toward the end of 1976, and the administrative responsibilities vested in these seven newly created divisions.

B. Workforce Profile

The Air Resources Board has experienced a steady growth in staffing since 1969. The Board has grown from a staff of 123 in 1969, to 405 persons in 1976. This represents a cumulative growth of 229 percent. Although staff positions vary somewhat, the following table represents the Board's current staffing configurations:

TABLE I

AIR RESOURCES BOARD

Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Administrator	34
Engineer	126
Attorney	2
Scientist	41
Technician	63
Clerical	58
Other*	<u>81</u>
TOTAL	405

*"Other" includes such classifications as programmers, draftsmen, laborers, librarians, etc.

Turnover in the Board averages 5 percent per annum. This turnover is considered average and accounts for persons seeking better paying jobs or career advancement in other agencies and programs. As position vacancies occur, the Board recruits new employees through a variety of methods: personal contacts, on a "walk-in" basis, and through the state Civil Service Commission.

A total of forty-one local air pollution control boards are staffed and operating within California. The local agencies are designated according to standard metropolitan statistical areas, population growth, industrialization, and level of ambient air contaminants. The local agencies are currently staffed with 941 professional/technical and 129 clerical positions. The local air pollution control agencies have somewhat stabilized in staff growth during the past two years. The following table depicts the staffing configurations for the local air pollution control agency by occupational type.

TABLE II

STATE OF CALIFORNIA

Local Air Pollution Control Agencies
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Administrator	106
Engineer	193
Inspector	236
Attorney	28
Sanitarian	62
Technical	90
Chemist	50
Data Processing Specialist	31
Public Information Specialist	16
Pollution Control Specialist	22
Meteorologist	11
Instrumentation Specialist	23
Other	73
TOTAL	941

The other category includes smog episode clerks, environmental management specialists, C.E.T.A specialists, statisticians, planners, maintenance workers, communications officers, mechanics, programmers, and librarians.

Turnover within the local agencies varies according to agency; however, the average rate appears to be from 5-15% annually. This turnover rate is considered moderate, and is attributed to general interest in the job and benefits. In addition, most employees have solid upward mobility opportunities within both the private and public sector. Consequently, some of the turnover is related to promotional opportunities.

As position vacancies occur, a variety of methods are used to fill

these vacancies: internal promotion, advertisements in professional journals, referral from professional organizations, and interviews at colleges and universities. In a number of instances, the agencies will accept applications from individuals on a "walk-in" basis.

In an effort to assess the workforce situation in the private sector, a variety of techniques have been utilized. Representatives from the Air Resources Board and staff members of the local air pollution control districts were interviewed and asked to estimate the number of persons involved in air pollution control and abatement activities within their respective jurisdictions. In addition, these projections were supplemented with information provided through on-site interviews and telephone conversations with selected private industries and utilities in the state.

There are 1,637 major installations in the state which emit over 100 tons of pollutants each year. It has been estimated that each of these installations have an air pollution control crew which varies in size and composition, with the smallest being one part-time engineer. The average crew size would appear to be one engineer, one part-time attorney, and a corps of one or more technicians.

The turnover rate for private industry is difficult to assess. Experts in the state indicate that turnover within private industry tends to be minimal. This factor is attributable to good salaries and employee benefits within the private sector. Further, it is projected that most

of these positions have relatively high seniority rating, and consequently, turnover is more frequently related to retirement.

As position vacancies occur within private industry, personnel recruitment methods similar to those used by the state and local air pollution control agencies are utilized. Among the methods used are: advertising in state and local newspapers, placing notices in professional journals, requesting referrals from professional societies and organizations, and through personal contacts. Private industry does not consistently recruit new employees through colleges and universities, since they prefer professionals with experience.

C. Workforce Projections

The Air Resources Board projects fairly substantial increases in staff requirements during the next five years. These increases have been attributed to meeting the goals set forth by the Board. The following table provides a breakdown, by position, of the workforce projections to 1982.

The average percentage figures were calculated by using the year-by-year percent change, then totaling and averaging those numbers to obtain a five-year average. All subsequent figures will be calculated in the same manner.

TABLE III

AIR RESOURCES BOARD

Workforce Projections to 1982 (est.)

<u>Position</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>%/annum turnover (average)</u>	<u>%/annum average (average)</u>
Administrators	34	40	43	45	47	49	5%	8%
Engineer	126	149	159	167	175	184	5%	8%
Attorney	2	3	3	4	4	4	5%	16%
Scientist	41	52	56	59	62	65	5%	8%
Technician	63	76	81	85	89	93	5%	8%
Clerical	58	69	74	78	82	86	5%	8%
Other	<u>81</u>	<u>91</u>	<u>97</u>	<u>101</u>	<u>107</u>	<u>113</u>	5%	7%
TOTAL	405	480	513	539	566	594	5%	8%

Any further change in the number of positions within the Board during the next five years will be a consequence of currently undefined enforcement duties or new air quality monitoring requirements. Further, it is anticipated that the adoption of the Clean Air Amendments would have an impact upon the staffing of the Board, but the degree and nature of the impact is as yet undefined.

The local air pollution control agencies predict steady, but limited growth in their agencies during the next five years. The average annual growth rate is approximately 2%. The major focus of the growth will be in the chemist, engineer, and meteorologist positions. There will also be some growth in the support staff; however, growth in the number of administrators and clerical positions will be less than one percent per annum. Based upon these projections for percent per annum growth, the following table represents the workforce projections for the local agencies to 1982.

TABLE IV

STATE OF CALIFORNIA

Local Air Pollution Control Agencies
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth/ decline (average)
Administrator	106	107	108	110	112	112	n/a	1%
Engineer	193	197	202	205	209	213	n/a	2%
Inspector	236	240	246	250	254	254	n/a	2%
Attorney	28	28	28	28	28	28	n/a	0
Sanitarian	62	63	64	65	66	67	n/a	2%
Technician	90	91	92	93	94	95	n/a	1%
Chemist	50	51	52	55	56	57	n/a	2%
Data Process- ing Special- ist	31	32	35	36	37	37	n/a	4%
Public Infor- mation Spe- cialist	16	16	16	17	17	17	n/a	1%
Pollution Con- trol Spec- ialist	22	22	22	22	22	22	n/a	0
Meteorologist	11	13	15	16	17	18	n/a	10%
Instrumenta- tion Spe- cialist	23	23	23	23	23	23	n/a	0
Other	73	70	63	58	48	47	n/a	-9%
TOTAL	941	953	961	983	983	990	5-15%	1%

The growth in the local air pollution agencies is directly related to expanded services under the existing programs. No new programs are planned, nor is consideration being given to diversification of existing programs.

Growth within the private sector is expected to correspond to the growth pattern of the state and local air pollution control agencies. Private industries indicated that there was a direct relationship between the enforcement and monitoring activities of the state and the program efforts of industry. Consequently, private industry predicts a growth of between one and two percent per annum during the next five years. The occupations experiencing the greatest growth will be in technical positions.

D. Training and Certification

The Air Resources Board offers a voluntary emission training program. The course, which is offered every two months, is held in six locations throughout the state. A concerted attempt is made by the Board to provide for maximum accessibility of the course. The educational program consists of four full days of training. Approximately 25 persons participate in each course.

The California State Air Resources Board offers a basic orientation program for new employees. The program is supplemented by staff sharing efforts. The Board does not have a mandatory continuing education policy for employees; however, the Board does encourage individual development efforts.

E. Career Potential

For the State of California, career prospects within the air pollution control and abatement field appear to have stabilized. During the past five years, the state and local agencies have experienced substantial growth. However, without the passage of new federal or state

legislation or regulations, there is no evidence to support a major workforce growth projection. There will be limited growth within the inspector, meteorologist, engineer, chemist, and data processing occupations. In most situations, however, position vacancies will occur as a result of turnover as opposed to creation of new positions.

Further, experts within the discipline indicate that passage of the Clean Air Amendments would have an impact upon staffing, but the extent and nature of such an impact are, to date, indeterminate. It is important to add that as yet undefined enforcement duties or new air quality monitoring requirements would have a significant impact upon both the private and public sector.

Information available on the public and private sectors indicate that as much as 90% of the specific skill training for both professional and technical personnel occurs on the job. On-the-job training most generally consists of an informal sharing of work methods and techniques with more experienced personnel. The training programs which are available through state universities, community colleges, and technical schools are not considered to offer the requisite degree of technical information. Additionally, there appears to be a noticeable discrepancy between the training and the on-the-job activities.

F. Conclusion

Two basic conclusions are apparent following a thorough review of the workforce projections for the air pollution control and abatement activities in the State of California:

- 1) that, even though, the workforce demands for personnel has somewhat stabilized as compared to the last five years, there will be a continual, though gradual, demand for qualified personnel at all levels within the air pollution control field;
- 2) that technically oriented training programs for both professionals and technical personnel are at a premium.

Experts within the field have indicated that there is a need for training programs in air pollution control occupational disciplines. Both private industry and the state and local agencies indicated a willingness to assist educational institutions with the development of such programs. Representatives from these agencies and industries reinforced the theory that educational institutions are better qualified for the development and ongoing implementation of such programs. However, they implied that such training programs of necessity should include input from potential employers.

II. NOISE

A. Introduction

The California Office of Noise Control, located in the State Department of Health, maintains primary responsibility for noise pollution control and abatement regulatory functions. To deal with the various sources of noise statewide, a number of agencies have been delegated enforcement responsibilities. Among the agencies involved in noise activities are: the State Highway Patrol, the State Housing and Community Development Commission, the California Department of Transportation, and the Attorney General's Office.

The major goal of the Office of Noise Control is to reduce the level of community noise. At its implementation in 1975, the Office was given the following responsibilities for achieving the principal goal:

- 1) to serve as a resource to other state agencies in design and operation of noise related programs and activities;
- 2) to coordinate on a statewide basis all noise programs;
- 3) to train state and local personnel in the principles and techniques of noise control;
- 4) to conduct noise research in fields where new information is required;
- 5) to provide technical assistance to communities and counties in design and operation of community noise programs.

The state requires that all counties submit, on an annual basis, general plans. The general plans include program strategies for development and operation of programs related to the following categories:

noise, land use, housing, circulation, open space, conservation, seismic safety, and scenic highways. These plans are reviewed by the Governor's Office of Planning and Research. As problems arise with individual noise programs, the Office of Planning and Research will contact the Office of Noise Control to secure assistance in reviewing the planning strategies with the goal of complying with state laws and regulations.

As expected, the State Highway Patrol is involved with noise control as it relates to motor vehicular noise. The method most commonly used by the Highway Patrol in enforcement of noise is issuing warning tickets and citations. During 1973, the Highway Patrol issued 113,000 road citings, 245,000 mechanical warnings, and 30,000 citations which resulted in court appearances. This method has proven to be the most effective method to date in controlling vehicular noise. The Highway Patrol is currently involved in implementing a program requiring muffler certification. This program, which will be coordinated through muffler manufacturers, is planned for implementation during 1977-1979.

The State Housing and Community Development Commission is involved with noise control only as it concerns enforcement of housing laws. The principal focus of the Commission's activities is upon insulation requirements in newly constructed buildings.

Two sections of the California Department of Transportation are involved with noise control activities: the Environmental-Chemical Branch of the Transportation Laboratory and the Aeronautics Division. The Aeronautics Division is charged with the responsibility for regulation of airport noise. The Division attempts to control noise through

a pre-construction permit program. The Division reviews all plans for construction of new airports. The review consists of an evaluation of safety criteria and an analysis for possible conflicts with other air environmental regulations. In addition to this review process, the Division administers a grant-in-aid program. The basic program provides loans for general aviation construction projects.

The Laboratory has six fundamental objectives:

- 1) to provide consultant and advisory services to the district transportation offices;
- 2) to develop methods and techniques for investigations and reports on environmental impacts;
- 3) to provide for centralized testing capabilities;
- 4) to review training and service programs to assure the quality of the environment;
- 5) to conduct transportation related research;
- 6) to promote interdisciplinary approaches to optimizing transportation services.

The Laboratory devotes a portion of its time to noise related activities; however, the exact person-year commitment specifically allocated to noise activities is unknown.

There are two sections of the Attorney General's Office, the Public Resource Section and the Environmental Programs Section, which have responsibilities in noise control. These two sections have authority for review of proposed noise related laws and regulations. In addition, the offices serve as state counsel in noise related litigation. Less than 1% of the Sections' staff time is allocated to noise related activities.

B. Workforce Profile

The State Office of Noise Control is staffed with five professional and two clerical positions. The five professional positions consist of two mechanical engineers, one civil engineer, one architect, and one psychoacoustician. The civil engineer is responsible for studies and programs relating to freeway noise, the architect is involved with programs relating to acoustical abatement in housing, and the psychoacoustician is pursuing research on human noise tolerance standards. Turnover in the Office, since its opening in 1975, has been nil. Position vacancies are filled through personal contacts and referrals from professional organizations.

The State Office of the Highway Patrol allocates approximately 1.2 to 1.7 person-years to noise administration. Two-thirds of the time is contributed by an engineer and one-third of the time is provided by clerical staff. The Highway Patrol also has a field staff of 12 highway patrol officers who perform the actual highway noise monitoring. The patrol officers commonly work in teams of two officers. Turnover within these teams is minimal. The low turnover is considered as a function of the recency of program implementation, and general job satisfaction. Patrol officers are recruited through the Highway Patrol training academy, and engineers are selected through the Civil Service System.

The Air Section of the Environmental-Chemical Branch of the Department of Transportation is charged with the noise related responsibilities. The Air Section has thirty-four staff members. The following table represents a breakdown of staffing by occupation type.

TABLE V
CALIFORNIA DEPARTMENT OF TRANSPORTATION
Environmental-Chemical Branch
Air Section
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Engineer	17
Chemist	8
Sanitarian	1
Statistician	1
Compliance Specialist	2
Engineering Technician	<u>5</u>
TOTAL	34

Two of the engineers devote a major proportion of their time to noise programs. The engineers have backgrounds and training in civil engineering.

There are 11 district offices which have a staffing of approximately 100 persons. These persons represent varied backgrounds in engineering, architecture, history, geography, biology, and engineering technology. A part of their time is allocated to noise activities, although no specific figures are available.

Turnover within the Environmental-Chemical Branch has been high during the past fiscal year. The Air Section has had a 90% turnover in staffing. This was the consequence of a total departmental reorganization. Under normal circumstances the turnover for the section averages 0-5% per annum. As position vacancies occur, the Branch recruits through the State Civil Service System.

The Aeronautics Division is staffed with 22 positions: 14 professional and 8 clerical positions. The following table presents the staffing configuration by occupational type:

TABLE VI
CALIFORNIA DEPARTMENT OF TRANSPORTATION
Aeronautic Division
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Administrator	2
Fiscal Officer	2
Engineer	2
Planner	2
Aviation Consultant	5
Other	<u>1</u>
TOTAL	14

The other position is a staff services analyst. Turnover within the Division averages less than 10% annually. The Division relies on internal promotions to fill position vacancies. The Civil Service System is used to fill positions when persons within the department are not available.

The Public Resources Section of the Attorney General's Office employs 37 attorneys, and the Environmental Programs Section is staffed by 35 lawyers. Turnover within these two sections averages around 10% annually. Positions are generally filled through the Civil Service System. There is no scarcity of applicants for available positions. There are an estimated 400 applicants for every available vacancy.

Due to the state law which requires counties to submit general plans for dealing with noise problems, each county has a noise control program. The December, 1975, issue of Sound and Vibration provided the following analysis of municipal noise ordinances.

TABLE VII

CALIFORNIA MUNICIPAL NOISE ORDINANCES

City	Nuisance	Zoning	Vehicle	Aircraft	Building	Construc- tion	Recrea- tional Vehicle	Rail- road
Alhambra	X	-	-	-	-	-	-	-
Anaheim	X	X	X	-	X	X	-	-
Arcadia	X	-	-	-	-	-	-	-
Berkeley	O	-	-	-	-	-	-	-
Beverly Hills	X	-	X	-	X	X	-	-
Buena Park	X	X	-	-	-	-	-	-
Burbank	X	X	O	-	-	O	O	-
Chico	X	-	-	-	-	X	-	-
Costa Mesa	X	X	X	X	-	X	-	-
Cotati	X	X	-	-	-	-	-	-
Cupertino	O	-	-	-	-	-	-	-
Downey	X	-	X	-	-	O	X	-
El Cajon	-	X	-	-	-	-	-	-
El Segundo	X	X	O	-	-	O	-	-
Escalon	X	-	X	-	-	-	X	-
Fountain Valley	X	X	-	-	-	X	-	-
Fresno	X	X	-	-	-	X	-	-
Fremont	-	X	O	-	-	-	-	-
Gardena	X	X	X	-	X	X	X	-
Garden Grove	-	-	-	-	O	-	-	-
Glendale	X	X	O	-	-	O	-	-
Glendora	X	X	O	-	-	O	-	-
Hayward	O	-	-	X	X	-	-	-
Hemet	O	X	-	-	-	-	-	-
Hermosa Beach	O	X	O	-	X	-	-	X
Inglewood	X	X	-	X	-	-	-	X
Larkspur	X	-	X	-	-	-	X	-
Lakewood	O	X	-	X	-	X	-	X
Lodi	-	X	-	-	-	-	-	X
Lomita	X	X	-	-	-	-	-	-
Long Beach	X	-	X	X	-	X	-	-
Los Altos Hills	-	X	O	-	X	-	-	-
Los Angeles	O	X	X	-	X	O	-	-
Los Banos	X	-	X	-	-	-	X	-
Lynwood	-	X	O	-	-	-	-	-
Manteca	-	X	-	-	-	-	-	-
Menlo Park	O	-	-	-	-	-	-	-
Monterey	X	X	-	-	-	-	-	-
Newark	X	X	-	-	-	-	-	-
Newport Beach	X	-	X	-	-	-	X	-

TABLE VII

(continued)

City	Nuisance	Zoning	Vehicle	Aircraft	Building	Construc- tion	Recrea- tional Vehicle	Rail- road
Navato	X	-	X	X	-	X	X	-
Oakland	O	X	-	-	-	-	-	-
Orange	X	X	-	-	-	X	-	-
Pacifica	O	-	-	-	-	-	-	-
Palo Alto	X	X	-	-	-	-	-	-
Pasadena	X	X	O	-	-	X	-	-
Pleasant Hill	X	-	X	-	-	O	-	-
Redding	X	-	X	-	-	-	X	-
Red Bluff	O	-	-	-	-	-	-	-
Richmond	-	X	X	X	-	-	-	X
Ross	X	-	X	-	-	-	X	-
Sacramento	O	-	-	-	-	-	-	-
Salinas	O	-	O	-	-	-	O	-
San Anselmo	X	X	X	-	-	-	-	-
San Bernardino	O	-	-	-	-	-	-	-
San Clemente	O	-	-	-	-	-	-	-
San Diego	X	X	X	-	X	X	X	-
San Francisco	X	X	X	-	-	X	X	-
San Marcos	X	-	X	-	-	-	X	-
San Jose	-	-	-	O	-	-	-	-
San Leandro	O	-	-	-	-	-	-	-
San Mateo	O	X	-	-	X	-	-	-
San Rafael	O	-	-	-	-	-	-	-
Santa Barbara	O	X	-	X	-	-	-	-
Santa Clara	O	X	-	-	-	-	-	-
Santa Fe Springs	-	X	-	-	-	-	-	-
Santa Maria	-	X	-	-	-	-	-	-
Santa Monica	-	-	-	O	-	-	-	-
Santa Rosa	X	X	X	-	-	-	-	-
Sausalito	X	-	O	-	-	-	-	-
Simi Valley	X	-	-	-	-	-	-	-
South El Monte	X	-	-	-	-	-	-	-
South Gate	X	-	-	-	-	-	-	-
Sunny Vale	O	X	-	-	-	-	-	-
Tracy	-	X	-	-	X	-	-	-
Torrance	X	X	X	-	-	O	-	-
Victorville	O	-	-	-	-	-	-	-

Key: X - Regulations including acoustical criteria
 O - Regulations not including acoustical criteria

(Chart excerpted from Sound and Vibration, December, 1975. Clifford R. Bragdon, Contributing Editor.)

The noise programs in the larger counties and municipalities generally represent a cooperative enforcement effort of the County Department of Health, County Building Commission, and the Police Department. In the smaller programs, the noise activities are most frequently coordinated through either the Police Department or the County Department of Health. It is estimated that there are between 175 and 200 persons involved with noise programs within the counties and municipalities. Occupations include engineers, industrial hygienists, police officers, field inspectors, and acoustical consultants.

Within the industrial sector there are a number of acoustical consultants, however, no figures are available on the number of consultants practicing in the state.

C. Workforce Projections

The State Office of Noise Control expects to double the staff by 1982. The Office will be requesting three engineers, one architect, and one psychoacoustician. No time frames have been established for adding these positions, and timing of the staff increase will be totally dependent upon available funding. The increase in staff is required as a consequence of growing demands for existing services. It is further predicted that the Office will expand its research component.

The State Highway Patrol is expanding its field staff from 12 persons to 21 persons during 1977. The total increase will be in the patrol officer category. The expansion in the field staff will result in more frequent monitoring of highway noise levels. No staff increase is being considered

following the 1977 growth. The state administrative office will maintain its current level of effort, 1.2-1.7 person-years/annum, during the next five years.

The Air Section of the Environmental-Chemical Branch of the Department of Transportation does not anticipate any expansion in existing program activities nor implementation of new programs. Consequently, there will be no increase in staff during the next five years.

The Aeronautics Division of the Department of Transportation is considering becoming involved in air carrier matters. Such involvement would create a staff position for a planner. The Division also predicts an increase in environmental noise activities. As this aspect of the program grows, the Division will add an acoustical engineer. No specific year has been defined for adding these positions. No other growth is predicted for the next five years.

Neither the Public Resources Section nor the Environmental Programs Section of the Attorney General's Office predicts growth in staffing during the next five years. The Sections have experienced limited growth during the last year, and it is expected that this growth will be satisfactory to respond to increased requests for program services.

Any figures provided for growth within the private sector would be purely speculative. However, experts indicated that the anticipated growth on the state level will affect the workforce requirements on the county, municipal, and industrial levels in a positive manner. It is further expected that there will be a growing demand for professionals and paraprofessionals with background and experience in acoustics.

D. Training and Certification

The State Office of Noise Control has sponsored training programs in cooperation with the University of California Extension Service. Courses have been offered in highway and aeronautical noise, general noise programming for local planning and health officials, and noise standards in building insulation. The courses in highway and aeronautical noise and the course for local planning and health officials are offered for 16 hours. The highway noise course is offered once during the year with an average enrollment of 75 participants. The local planning and health officials course is offered six times annually with a total enrollment of 75 persons. The local building inspectors course is 8 hours in length and is offered in five locations. Approximately 400 building inspectors attend the courses annually. All three courses will be offered annually during the next five years.

E. Career Potential

The careers in the community/environmental noise field have been emerging during the past five years; the trend toward amplification and diversification in noise programs on both the state and local levels is expected to continue during the next five years. The growth is expected to be focused upon professional occupations with background in acoustics and engineering.

While most of the predicted growth for the next five years is apparently centralized within the state control agencies, it is anticipated that the growth in state programs will have a catalytic effect upon workforce requirements within the private sector.

F. Conclusion

Noise programs in the State of California have experienced steady growth over the past five years. This trend toward steady growth is expected to continue for the next five years. Experts in the field believe that of all environmental protection emphases, the area of noise has the greatest potential for resolution of problems. Technology is not currently available which would allow for the cleansing of the oceans, but technology does exist which can be used to control most aspects of environmental and community noise. Experts believe that, as more research is conducted upon the effects of noise levels upon human behavior and human tolerance, the public and the federal agencies will become aware of the pressing need for more stringent noise control programs. This awareness will serve as a catalyst in expanding federal and state noise enforcement and monitoring activities and community noise abatement programs.

III. PESTICIDES

A. Introduction

The Agricultural Chemicals and Feed Division of the California Department of Food and Agriculture is the principal pesticide regulation and control unit within the state. Until recently, the Division has been primarily concerned with product registration, product quality, and certification of agricultural pest control advisers and commercial applicators. Late in 1975, the Division assumed responsibility for the coordination of the private pesticide applicator certification program. Training for the private applicator program is being administered through the Office of Pesticide Applicator Training of the California Extension Service.

The Agricultural Chemicals and Feed Division has five basic enforcement activities within the pesticide control area. These include administration and enforcement of:

- 1) state pesticide use laws;
- 2) pesticide spray residue laws;
- 3) restricted pesticide materials laws;
- 4) feed and fertilizer laws;
- 5) worker safety programs.

In addition, the Division has coordinated the Commercial Applicator Licensing Program since 1948 and the Agricultural Pest Control Advisers Licensing Program since 1972. In California, the Commercial Applicator Licensing Program began on an individual county by county basis as early as 1916.

The California Agricultural Pest Control Adviser Licensing Program is considered unique. Under the regulations of this program an "agricultural pest control adviser means any person, who, as a requirement of, or incidental to his employment or occupation, offers a recommendation to a producer of an agricultural product or to any public or private agency concerning any agricultural use, or who holds himself forth as an authority or general adviser on any agricultural use to a producer of an agricultural product." As an additional precaution, the state law also requires that the Adviser submit any recommendations in writing. One copy of the recommendation, signed and dated, must be furnished to the grower. In instances where pesticide use is recommended, a copy of the report must also be provided to the dealer and applicator. Through such a licensing program, the state has developed a structure which purportedly protects the consumer from soliciting and purchasing advice on agricultural pest control from knowledgeable or negligent sources. Likewise, the law protects the adviser from claims of misfeasance based solely upon hearsay.

The Pesticide Residue Laboratory of the California Department of Food and Agriculture provides laboratory support and assistance to the Division and to the County Agricultural Commissions in the analysis of pesticide residues. The field staff of the division and the county agricultural commissioners are mainly responsible for the collection of the samples.

B. Workforce Profile

To carry out its mandates the Agricultural Chemicals and Feed Division is currently staffed with 84 persons. It should be noted that this staffing configuration represents both headquarters personnel

(forty-eight) and the eight district offices (thirty-six). Of the 48 persons situated in the headquarters in Sacramento, 20 of the positions are clerical. The following table represents the breakdown of professional and technical staff by occupational type:

TABLE VIII
CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
Agricultural Chemicals and Feed Division
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Administrator	3
Inspector	32
Field Supervisor	10
Area Supervisor	4
Registration Specialist	8
Technician	<u>7</u>
TOTAL	64

All 64 positions are filled by persons with backgrounds in chemistry, entomology, plant pathology, agricultural education, and biology. The turnover rate for the Division has been negligible during the past year with an average of about 2% annually. Professional, technical, and clerical employees are all hired through the state Civil Service System.

The Pesticide Residue Laboratory is currently staffed with 14 chemists. Six of the chemists are situated in the Sacramento headquarters office, the remaining eight are located in Downey, Fresno, and Berkeley field offices; 4 in Downey, 2 in Fresno, and 2 in Berkeley. Turnover for the laboratory is minimal. The laboratory has not experienced any turnover in the last three years. The Laboratory recruits new employees through the state Civil Service System.

The actual training responsibility for the pesticide applicator certification program has been delegated to the California State Extension Service. The program has been operational since November, 1975. Dr Michael Stimmann, Director of the Office of Pesticide Applicator Training, is assisted by one staff research analyst. Dr. Stimmann, together with the research analyst, has developed the pesticide applicator training manuals. The training programs will be conducted at various locations throughout the state; however, it is currently impossible to determine the number of persons who will be serving as instructors or the number of locations at which the programs will be offered. The California Extension Service will not be directly involved with coordination of actual training programs. Instead, the office will advertise the availability of the training materials, and those persons or agencies with expertise and credentials in pesticide use will be encouraged to utilize the available materials to sponsor training programs. It is anticipated that a major portion of the 106 state community colleges will elect to develop training programs. Other agencies and organizations which may choose to coordinate an education program for pesticide applicators include county cooperative extension offices, agricultural programs, and industries which employ pesticide trainers.

In addition to the staff effort of the Training Office, there are 256 farm advisers located in the county extension service offices. Approximately 75% of the advisers allocate a certain proportion of their time to sponsoring pesticide related workshops.

The California Extension Service also has an operable Pesticide Education Coordinating Unit. The program has as its general emphasis the development of pesticide safety programs. The program is directed by Dr. A. E. Swift.

The California Extension Service has three agricultural experimental stations located in Berkeley, Davis, and Riverside. There are approximately 150 Agricultural Specialists employed through these programs. The focus of their activities is agricultural research, consulting, and materials development and publication. An undetermined amount of their time is directed toward pesticide related programs.

William Griffith heads the Pesticide Investigation Laboratory located in Sacramento. The Laboratory has three basic functions:

- 1) review losses in fish and wildlife caused by pesticides;
- 2) monitor pesticide residue levels and its relationship to marine life, inland fish, and wildlife;
- 3) perform evaluations on pesticide products seeking registration and on pesticide use programs of other agencies.

The Laboratory is currently staffed by six full time professionals: one administrator, two wildlife biologists, one fish and marine life biologist, and two agricultural chemists. The full time professional staff is supplemented by a corps of 18 to 25 seasonal assistants. Turnover within the professional staff is minimal. New employees are recruited through the state Civil Service System.

According to California law, there are two classifications of private sector pesticide applicators: private and commercial. The commercial applicator classification is subdivided into ten categories: forest

pest control, seed treatment, aquatic pest control, regulatory pest control, research and demonstration pest control, ornamental and turf pest control, industrial, institutional, structural, and health related pest control, public health pest control, agricultural pest control, and right-of-way pest control. It is estimated that there are approximately 2,000 commercial firms within the state that perform general pest control services. These firms are staffed with an average crew of three to four persons: one supervisor and two to three applicators. In addition to the commercial applicators, it is estimated that there are approximately 700 agricultural pest control advisers. It is further estimated that there are 65,000 farmers in the state who apply pesticides.

While available information on the private sector is sketchy, it is expected that there are a number of university botanists, plant pathologists, entomologists, conservationists, agronomists, sanitarians, chemists, and engineers in the state that are involved in private research and consulting in pest control; unfortunately, no specific figures are available.

C. Workforce Projections

Within the Agricultural Chemicals and Feed Division it is estimated that the staffing level will significantly increase in the professional positions during the next five years. The growth will be focused in the inspector category, with an average annual growth of 16%. This growth reflects both the increased Division staff load generated through the Applicator Certification Program and the growth in demand for Division

services as a consequence of the increased sophistication of agricultural chemicals. The following table depicts the growth in the Division by occupational type.

TABLE IX
CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

Agricultural Chemicals and Feed Division
Workforce Projections to 1982 (est.)

<u>Position</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>%/annum turnover (average)</u>	<u>%/annum growth (average)</u>
Administrator	3	3	3	3	3	3	n/a	0
Inspector	32	40	48	56	64	73	n/a	18%
Field Super- visor	10	10	10	10	10	10	n/a	0
Area Super- visor	4	4	4	4	4	4	n/a	0
Registration Specialist	8	8	8	8	8	8	n/a	0
Technician	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>n/a</u>	<u>0</u>
TOTAL	64	72	80	88	96	105	2%	10%

Alternatively, the Pesticide Residue Laboratory does not anticipate any further growth in staffing. Staffing of the department has been stable since 1975, and no program expansion or project development is planned which would impact the staffing of the Laboratory.

As the Pesticide Applicator Training Program becomes fully implemented the Office of Pesticide Applicator Training may require additional staff. It is estimated that a maximum of two staff positions will be necessary: one research assistant and one clerical position. No time frames have been developed for expansion of staff, as any staff increase will be dependent upon the availability of program funds.

No growth is predicted for the Pesticide Education Coordinating Unit. It is expected that there will be expansion in pesticide education activities offered through community colleges and state colleges and universities. However, the Coordinating Unit will serve more as a catalyst in encouraging involvement, rather than hosting major educational series through its office.

The Pesticide Investigation Laboratory will not experience any growth during the coming five years. No major expansion in program services is planned, nor are any new services being considered.

There will be substantial growth in pesticide programs within the private sector. More emphasis will be placed upon the skills and techniques utilized by the integrated pest managers. Experts within the area indicated that they expect as much as ten to fifteen percent annual growth in the number of pest managers. There will be a concomitant growth in the number of commercial applicators. As there is a trend toward the use of more sophisticated chemicals which require more experience and knowledge to apply, farmers will probably seek professional assistance in the application of these chemicals. It is also projected that there will be growth in the number of commercial and industrial operations using professional applicators during the next five years. This growth is expected to average 5-15% annually.

D. Training and Certification

The principal thrust of pesticide training and certification in the state is focused upon the agricultural pest advisers and pest

applicators. By law, the agricultural pest advisers must annually apply to the Agricultural Chemicals and Feed Division for a license to operate within the state. Prior to licensing the applicant must pass an examination which demonstrates an ability to conduct pest control operations and knowledge of the nature and effect on materials which are used in pest control. Examinations are given in seven basic areas:

- 1) Insects, mites, and other invertebrates,
- 2) Control of plant pathogens,
- 3) Control of Nematodes,
- 4) Control of vertebrate pests,
- 5) Control of Weeds,
- 6) Defoliation,
- 7) Plant growth and regulation.

Currently, there are an estimated 700 persons certified and licensed as agricultural pest advisers. The Division does not maintain records on the number of persons certified by category, since there are many of advisers who elect to be certified in more than one category. It is anticipated that there will be growth in the number of persons seeking licensure as advisers; however, no estimate is available on the average annual increase in the number of persons seeking licensure.

As mentioned in the Workforce Profile, the California Office of Pesticide Applicator Training is currently developing the instructional materials for applicator training programs. The training programs will be made available for use by qualified pesticide instructors by late 1977. No projections can be made on the number of locations at which the programs will be offered,

or on the number of persons who will be participating in the programs. More information will be available as the programs become operational in the Fall of 1977.

The Training Office is giving consideration to offering supportive training programs beginning in 1978. Topics which are being reviewed for potential development are Upgrade Training for Applicators, Pesticide Use for Greenhouses, and Spanish Speaking Applicator Training.

The Department of Food and Agriculture will be the agent coordinating the certification of applicators. To be certified, an applicator must pass a qualifying examination in a particular category in which he wishes to be licensed. Under the California program, commercial applicators will be certified under one or more of the following categories:

- 1) Agricultural Pest Control
- 2) Forest Pest Control
- 3) Ornamental and Turf Pest Control
- 4) Seed Treatment
- 5) Aquatic Pest Control
- 6) Right-of-Way Pest Control
- 7) Industrial, Institutional, Structural, and Health Related Pest Control
- 8) Public Health Pest Control
- 9) Regulatory Pest Control
- 10) Demonstration and Research Pest Control.

To be certified in one of these categories, the applicant must successfully complete two examinations. One examination is a general examination

which tests the individual's competence and understanding of generalized application skills and techniques and federal and state laws and regulations. The second type of examination tests the individual's expertise in the technology and skills relevant to the particular type of application category in which the applicator is petitioning for certification.

The Department of Food and Agriculture is hesitant to project the number of persons seeking certification under this program. Prior to 1976, the Department offered a Licensing Program for Commerical Applicators. At present, 2,000 commerical applicators are licensed. The Department expects this number to increase with a maximum potential growth of 10,000. No projection can be made, at this time, concerning the number of private applicators who will seek certification. With 65,000 farmers in the state, the Department estimates that anywhere from 3,000 to 30,000 farmers may seek certification.

State colleges and professional organizations are becoming active in developing training in pesticide related areas. One example is the coordinated effort of the University of California, the Department of Food and Agriculture, and the California Association of Pest Control Advisers in the development of a series of pesticide training programs. The program series is merely in the planning stages, and as such, no specific information can be given on the number of hours of training or the number of locations. However, it is estimated that as many as 4,000 professionals may attend the series. Topics being considered for the program series are:

- 1) Crops and their relationship to pesticide use;
- 2) Pest Identification;
- 3) Pesticide Chemicals;

- 4) Types of Application Equipment;
- 5) Biological Control;
- 6) Integrated Pest Management;
- 7) Sampling Techniques;
- 8) Problems of Pest Resistance and Its Ramifications.

Other topics under discussion are Crop Production and Irrigation Techniques.

E. Career Potential

The career potential for personnel in both the private and the public sectors appears strong. It is projected that there will be a major increase in the demand for agricultural pest advisers, pest managers, and commercial applicators as a result of stricter enforcement activities and increased dependency upon more sophisticated chemicals. These factors will also impact two emerging occupations: commercial pesticide consultants and irrigation specialist for disease and insect control. While these professions are in existence to a limited degree at present, the demand for these specialities will grow significantly. The skills and knowledge required by professionals in these occupations will continue to diversify as new technology and more sophisticated chemical pesticides are introduced onto the market.

F. Conclusion

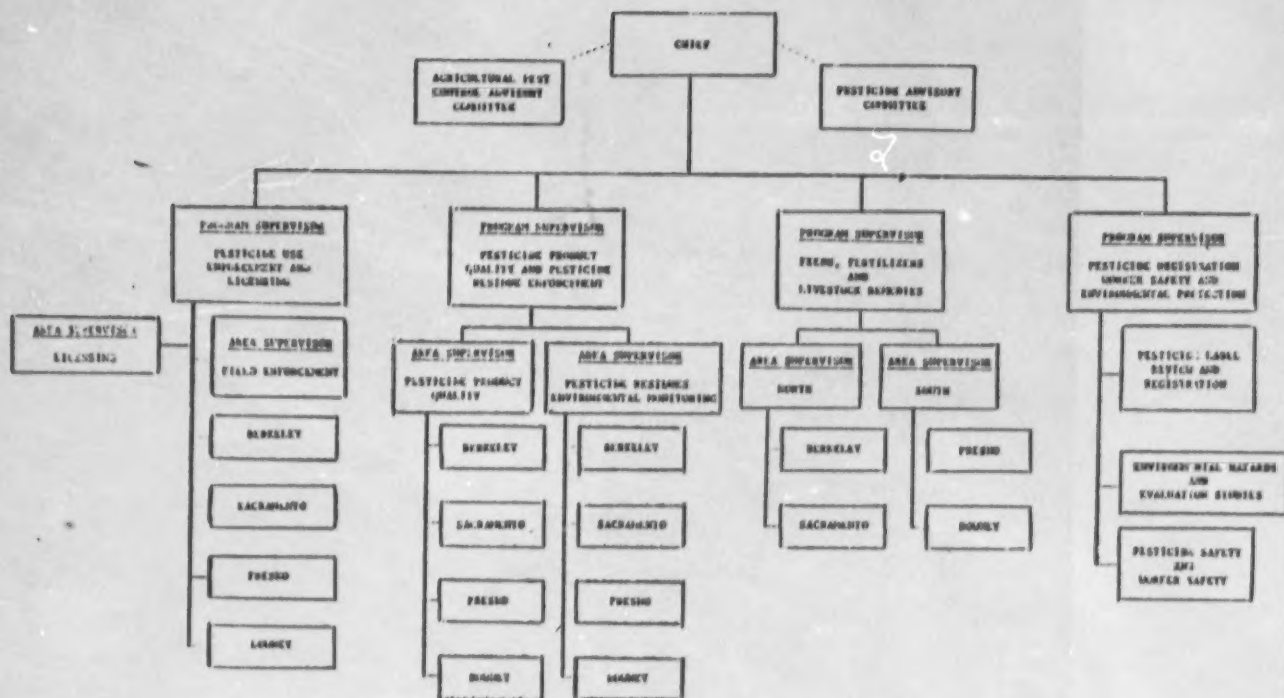
Following a review of pesticide control activities in California, these conclusions can be made:

- 1) that the workforce situation in the principal public agencies is expected to grow to a limited extent during the next five years; this growth is a consequence of increased demands upon staff posed by the applicator certification program.
- 2) that the private sector pesticide related occupations will experience a rapid growth and diversification as legislative enforcement activities increase and as new, more complex chemical pesticides are introduced onto the market.

From these conclusions it appears that there will be an increased reliance upon the commercial applicator and that the private farmer will not be involved in pesticide application to the degree experienced over the past five years.

In addition, as the demand for professionals and technicians in the pesticide control field increases, state educational and training institutions will give more consideration to the design and implementation of pesticide career training and continuing education programs. This emerging interest is evidenced by the activities of the University of California in the coordination of the aforementioned proposed pesticide training series.

**AGRICULTURAL CHEMICALS AND FEED
ORGANIZATIONAL CHART**



IV. POTABLE WATER

A. Introduction

The authority for supervision and administration of potable water programs for the State of California is vested in the California Department of Health. The Department directly supervises the operation of 1,100 community water systems with a minimum of 200 service connections. There are an additional 3,000 to 5,000 water systems that are supervised by the county health departments. The systems regulated by the county health departments have fewer than 200 service connections per system. Cumulatively, these systems serve approximately 90 percent of the state's population. Fifty-three percent of the population is served by surface water sources, and 41 percent is served by ground water sources.

In addition to the regulation of public water supplies, the Department of Health has a broad range of responsibilities related to potable water programs. These responsibilities include:

- 1) regulation of shellfish growth in water;
- 2) maintenance of the quality of recreational water areas;
- 3) provision of technical assistance to other state agencies concerning public water related programs and services;
- 4) certification of all water treatment plant and water distribution system operators;
- 5) maintenance and updating of information on public water supplies;
- 6) review and approval of construction plans for water systems with 200 connections or more;
- 7) provision of technical assistance to cities, rural water districts, consulting engineers, state and federal agencies, individuals and equipment operators.

B. Workforce Profile

The Sanitary Engineering Section of the Department of Health has administrative responsibilities for the potable water programs. The Section has a current staffing level of 68 persons: 57 professional/technical positions, 9 clerical positions, and 2 temporary workers. The following table illustrates the breakdown of the Section's staff by occupational type.

TABLE X
CALIFORNIA DEPARTMENT OF HEALTH
Sanitary Engineering Section
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Administrator	3
Engineer	45
Engineering Specialist	8
Engineering Technician	1
Clerical	9
Other	<u>2</u>
TOTAL	68

The Other category consists of the two temporary workers. the turn-over for the Section is considered to be relatively low, with an average annual rate of 5%. When position vacancies occur, the Section recruits through colleges and universities, professional conferences, and personal contacts. On occasion, the Section will accept applications from individuals on a "walk-in" basis.

Workforce figures for the county health departments potable water programs are sketchy. There are 53 counties in California, and each county has a county health department. Based upon a partial survey

of county departments, it is estimated that there are from one to five persons employed in each department with partial responsibility for potable water programs. The employees frequently have backgrounds and experience as engineers, engineering technicians, and/or sanitarians. The turnover within those agencies surveyed is low, with an average annual rate of between 0-5%. Recruitment procedures varied with the agency.

The State Department of Health maintains records as to the number of operators certified by Grade qualifications. There are five grades of certified operators in California: Grade I, II, III, IV, and V. The qualifications for each grade are based upon a combination of educational and on-the-job water treatment experience. The Grade I operator has the lowest level of qualifications: no training or related work experience is required. The highest classification, Grade V, requires a minimum of a college degree plus one year on-the-job experience or two years as a Grade IV operator plus five years related work experience.

As of December, 1976, the following number of operators were certified.

TABLE XI

STATE OF CALIFORNIA

Certified Water Treatment Plant Operators (1976)

<u>Grade</u>	<u>1976</u>
I	744
II	2,386
III	1,461
IV	399
V	289
TOTAL	5,279

Turnover for the Grade I operator is the highest with an average of 10-15% annually. The turnover is considered high, due to the fact that most Grade I operators, once they gain the requisite work experience, can qualify for higher classification jobs. Likewise, the Grade II operator turnover is estimated at 10% annually. This turnover is similarly attributed to the upward mobility opportunities. Grade III and IV are somewhat more stable, with turnover estimated at 5% per annum. The upward mobility for these positions is more limited than that for the Grade I and II operators. The Grade V operator category has the lowest turnover, with an estimated turnover rate of 2% per annum. Most turnover within this category is due to retirement.

Information regarding other employees in the private sector is limited. A partial survey of water treatment facilities within the state indicated that crews vary in size and composition, with the smallest facility being operated by one operator/maintenance worker. The largest water treatment facility in California is the Department of Water and Power of the City of Los Angeles. The Department currently employs 10,454 persons to administer and operate the combined water and power facility. It is difficult to determine the exact number of water supply employees; however, the following table depicts the major segment of employees who devote a portion of their activities to water supply programs.

TABLE XII

STATE OF CALIFORNIA

LOS ANGELES DEPARTMENT OF WATER AND POWER
 Water Supply Related Workforce
 Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Meter Reader	109
Service Representative	13
Maintenance Worker	595
Equipment Operator	422
Water Utility Worker	218
Mechanic	27
Supervisor	48
Superintendent	17
Operator	21
Engineer	35
Scientist	10
Other	<u>171</u>
TOTAL	1,767

The Other category includes pipefitters, plumbers, pumping plant supervisors, water treatment plant supervisors, meter repair persons, meter workers, and aqueduct workers. The number of administrative and clerical persons who devote a portion of their time to water supply activities was unavailable. The turnover rate for the department was also unavailable; however, during the past year the department has experienced a reduction in staff. As position vacancies occur, the positions are phased out, and the responsibilities are reassigned to other staff members. This trend is expected to continue for the next five years.

The occupations found within the Los Angeles Department of Water and Power are representative of the staffing structures found in

comparable water treatment programs. No further information is available on the public sector water treatment workforce.

C. Workforce Profile

The Sanitary Engineering Section of the Department of Health does not anticipate any additional growth during the next five years, unless funds become available through federally funded programs. The Section is currently staffed with 68 persons who devote approximately 70% of their time to domestic water supply regulation. Neither the staffing level nor the percent of the staff effort is expected to increase through 1982.

As with the state programs, the county health departments do not anticipate an appreciable growth in staffing requirements. Most representatives surveyed indicated that current staffing levels would be adequate to respond to existing program requirements. They further indicated that they did not anticipate any growth or diversification in program services.

Minimal growth is estimated for the private sector. A maximum of one to two percent per annum in all occupations related to water supply is predicted through 1981. All growth would be related to growth in the population and its resulting increase in water consumption.

D. Training and Certification

The Sanitary Engineering Section has the administrative authority for the Water Treatment Plant Operator Certification Program. The Program was implemented in 1975. Since that time, 5,279 operators have

participated in the certification programs. The certification examinations are offered in numerous locations throughout the state to provide ready accessibility of the program to interested participants. The Section does not predict an increase in the number of certified operators during the next five years.

There are a number of training programs available in the state for persons interested in water related programs. The San Marcos Training Center, principally a wastewater treatment training facility, does offer programs which are applicable to water treatment facility personnel. Such classes include courses in laboratory analysis, mathematics, maintenance, and safety. No estimate is available on the number of water treatment plant employees who participate in the programs annually. A total of 480 persons participated in training available through the Center during 1976. During the coming five years the number of persons participating in the programs is expected to grow steadily.

Training in water supply is also available through several community colleges in the state. Foremost among the colleges offering programs are Orange Coast, Santa Ana, Contra Costa, Sacramento City, and Sierra. These colleges offer ongoing water and wastewater treatment programs. Cumulatively, these colleges train an average of 425 operators annually. A steady growth in enrollment is projected for these courses during the next five years.

Other of the 106 community colleges in the state offer sporadic water supply training programs; however, no information is available on the enrollment in these programs.

E. Career Potential

Career opportunities within the Sanitary Engineering Section of the Department of Health will be minimal during the next five years. The Section does not anticipate any growth in either the size of the staff or in the amount of staff effort devoted to potable water programs.

There will be limited staff expansion in water supply programs operated through the county health departments. The departments estimated that current staffing levels will continue to be adequate through 1982.

The municipal water treatment facilities within the state will experience a maximum of one to two percent growth within the next five years. This growth will be related to increased population and the consequential demand for customer service.

Upward mobility within the Grade I and Grade II water treatment plant operators is strong. The high degree of mobility is demonstrated by the high turnover rates. The upper grade operators have more limited upward mobility opportunities. Most turnover in these positions is attributable to retirement.

F. Conclusion

The workforce requirements and career opportunities for water supply programs within the State of California have stabilized. Little growth in either the private or the public workforce is anticipated during the next five years. In addition, training programs for all levels and types of occupations in the potable water field are readily accessible.

Experts within the field indicated that any growth within the potable water field would be directly related to federal legislation or federal or state requirements. To date, there is no apparent emerging legislation of this nature which would have an appreciable impact upon the water programs in California.

V. RADIATION

A. Introduction

The Radiologic Health Section of the California Department of Health is the primary environmental radiation and radiological health administrative agency within the state. The Section has one satellite office located within the Bureau of Occupational and Radiation Management at the Community Health Services Agency in Los Angeles. The principal function of the agencies is to eliminate unnecessary and unproductive man-made radiation. The programs have six basic activities:

- 1) regulation and inspection of X-ray equipment;
- 2) licensing and inspection of all users of radiation;
- 3) examination and certification of professional competence of persons who use radiation in the healing arts;
- 4) environmental surveillance activities contracted from Nuclear Regulatory Commission;
- 5) general environmental surveillance and monitoring in areas adjacent to nuclear power facilities;
- 6) source related analysis of milk, water, and sewage.

Under the state radiation equipment licensing activity, California has a regulatory licensing program for medical and industrial radiological X-ray programs. There are an estimated 17,510 dental and 12,556 medical X-ray programs within the state. In addition, there are 249 programs with Nuclear Regulatory Commission licenses and 1,685 Agreement State licenses. (Statistics taken from a report prepared for the U.S.

Department of Health, Education, and Welfare, Report on State and Local Radiological Health Programs, October, 1976.)

The 1,685 Agreement State Licenses are categorized into five classifications: 1) medical, 2) academic, 3) industrial, 4) civil defense, and 5) other. There are 552 medical licenses, 77 academic, 805 general industrial, 71 civil defense, and 180 other. Of the 1,685 licensees, 500 of the facilities are located within the Los Angeles District.

B. Workforce Profile

The Radiologic Health Section is currently staffed with thirty-one professional/technical positions and twenty-two clerical positions. The following table illustrates the distribution of staff by occupational type:

TABLE XIII
CALIFORNIA DEPARTMENT OF HEALTH

Radiologic Health Section
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Radiation Health Physicist	16
Radiation Protection Specialist	12
Research Writer	1
Administrator	1
Other	1
TOTAL	31

The Other position is a student assistant. The Section provided the following breakdown of staff effort in terms of person-year allocations:

11.4 in licensing, 17.0 in inspection, 2.8 in environmental monitoring, 31.6 in X-ray inspection, and 16.7 in X-ray certification.

Turnover within the program is minimal. As vacancies occur in the Section, numerous recruitment methods are used to advertise the positions. The Section contacts the Health Physicist Society and the Radiation Technology Society for referrals. In addition, advertisements are placed in professional journals and local newspapers. On occasion, the Section will interview applicants on a walk-in basis.

The radiation program, located within the Bureau of Occupational and Radiation Management in Los Angeles, is currently staffed with nine professional/technical positions and three clerical positions. The following table provides a breakdown of agency staff by occupational type.

TABLE XIV
COMMUNITY HEALTH SERVICES

Bureau of Occupational and Radiation Management
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Radiation Health Physicist	3
Radiation Protection Specialist	5
Administrator	<u>1</u>
TOTAL	9

Turnover within the Bureau averages about one person per year, e.g., 18%. As position vacancies occur, the Bureau recruits through professional societies, hospitals and clinics with existing radiological health programs, and professional journals.

Workforce statistics for the "radiation control" occupations within the private sector are difficult to assess. However, the Section was able to provide a general overview of activities within the state. Of the 552 medical licensees, there are approximately 156 clinics which have at least one radiation safety officer. In the larger facilities, a Radiation Safety Commission assists in defining policies and programs relevant to radiation control. There is no estimate for either the number of functioning commissions or the number of persons serving on the commissions. Most of the 77 academic institutions with licenses have full-time staff members responsible for radiation control. At the smaller institutions, the radiation control crew will generally consist of one safety officer and one assistant. At the larger institutions, the crew will frequently be composed of one safety officer and three to four assistants. Within the 805 industrial licenses, the crew size will range in size from two to twenty. The 71 civil defense licensees are civil defense safety programs. Each county in California has a program in civil defense. The training programs available through each county are usually directed at emergency training for fire departments and police departments. There is usually at least one instructor per program. The 180 other licensees are frequently governmental programs such as the Department of Health. In most instances, there is one radiation control specialist at each of the 180 programs.

The Energy Research and Development Administration (ERDA) has also provided estimates on the nuclear related technician workforce within California. The following information on the available nuclear related

workforce was taken from the ERDA publication entitled An Analysis of Nuclear Related Technician Manpower in Western States.

TABLE XV
STATE OF CALIFORNIA

Nuclear Related Technician Workforce
Current Estimate (1976)

<u>Job Title</u>	<u>1976</u>
Production, Test or Research	
Reactor Operator	69
Accelerator Operator	125
Radioisotope - Production Operator	85
Nuclear Power Plant Operator	132
Nuclear Material Processor, Senior	16
Hot-Cell Technician	34
Nuclear Facility Equipment Operator	206
Nuclear Facility Maintenance Technician	174
Plutonium Handling Technician	43
Tritium Handler	3
Other Nuclear Test and Production Technician	7
Radiation Control Technician	272
Nuclear Facility Chemistry (Radiochemistry Technician)	303
Non-Destructive Testing Technician	606
Radiographer	442
Nuclear Geological Technician	11
Nuclear Technician Custodian	16
Instrumentation and Control Technician	116
Well-Logging Technician	110
X-ray Calibration Technician	33
Radiologic Technician	2,197
Nuclear Medical Technologist	736
Urology X-ray Technician	65
Orthopedic Radiologic Technician	62
Special Procedures Technician	263
Radiation Therapy Technician	205

TABLE XV
(continued)

<u>Job Title</u>	<u>1976</u>
Internal Dosimetry Technician	20
Radiobiology Technician	275
Radiopharmacist	31
Inhalation Toxicology Technician	10
Other Medical-Related (Nuclear) Technician	1
Soils Evaluation Technician	<u>629</u>
TOTAL	7,297

C. Workforce Projections

The Radiologic Health Section anticipates adding from five to six persons to the staff during the next five years. Three of the five positions would be added to the X-ray inspection program, and the remaining two positions will be added to the X-ray licensing program. No specific time frames have been developed for adding these positions. Minimal expansion is anticipated within the environmental monitoring program; consequently, no new positions will be added.

The Bureau of Occupational and Radiation Management in Los Angeles estimates that a maximum of two positions will be added to the Bureau during the next two years. A request will be made for one health physicist and one senior radiation protection specialist. The growth will be in response to increasing demands upon staff time. No expansion or new programs are currently planned.

Growth projections for the private sector are sketchy. The Radiologic Health Section estimates that there will be limited growth during the next five years. There may be as much as one to two percent annual growth in safety officer requirements, five percent growth in the demand for X-ray technicians, and five percent increase in the demand for radiation health specialists, and a maximum of five percent growth in the demand for health physicists.

The ERDA report on nuclear related workforce requirements does contain information on the estimated number of persons to be employed in the nuclear related technician field during 1977. The following table contains information on 1977 workforce projections and also the calculated annual growth rate between 1975 and 1977.

TABLE XVI

STATE OF CALIFORNIA

Nuclear Related Technician Workforce
Workforce Projection (1977)

<u>Job Title</u>	<u>1977</u>	<u>%/annum growth</u>
Production, Test or Research		
Reactor Operator	72	4%
Accelerator Operator	152	12%
Radioisotope - Production		
Operator	91	15%
Nuclear Power Plant Operator	141	14%
Nuclear Material Processor, Senior	19	13%
Hot-Cell Technician	39	9%
Nuclear Facility Equipment		
Operator	230	18%
Nuclear Facility Maintenance		
Technician	181	7%

TABLE XVI
(continued)

<u>Job Title</u>	<u>1977</u>	<u>%/annum growth</u>
Plutonium Handling Technician	56	37%
Tritium Handler	4	27%
Other Nuclear Test and Production Technician	7	5%
Radiation Control Technician	300	10%
Nuclear Facility Chemistry (Radiochemistry Technician)	375	18%
Non-Destructive Testing Technician	660	16%
Radiographer	480	12%
Nuclear Geological Technician	13	38%
Nuclear Technician Custodian	3	7%
Instrumentation and Control Technician	145	17%
Well-Logging Technician	123	18%
X-ray Calibration Technician	38	20%
Radiologic Technician	2,348	9%
Nuclear Medical Technologist	858	18%
Urology X-ray Technician	71	8%
Orthopedic Radiologic Technician	71	16%
Special Procedures Technician	299	15%
Radiation Therapy Technician	229	12%
Internal Dosimetry Technician	23	15%
Radiobiology Technician	288	1%
Radiopharmacist	41	32%
Inhalation Toxicology Technician	1	7%
Other Medical-Related (Nuclear) Technician	1	0
Soils Evaluation Technician	652	5%
TOTAL	8,011	10%

During the past three years there has been an average estimated growth of 10% in the nuclear related technician workforce. If this trend continues, by 1981 there will be approximately 11,560 persons employed in the nuclear technician related workforce.

D. Training and Certification

The Radiologic Health Section provides new employees with extensive on-the-job training. During the first week on the job, the new employee attends a general orientation program. The orientation session consists of formal discussion concerning agency processes and procedures. Following the orientation, the new employee participates in an informal six-month apprenticeship program. During the apprenticeship, the new employee works with more experienced employees. The apprenticeship training serves to initiate the new employee into the departmental and technical procedures. Most persons recruited into the program should have backgrounds in radiological health, health physics, or bionucleonics.

The Radiologic Health Section encourages the staff members to participate in formal continuing education programs. It is estimated that each professional staff person participates in an average of ten days of upgrade training annually. Many of the courses attended by the staff are offered through Oak Ridge University Association. The programs are offered by the Nuclear Regulatory Commission. Other programs are available through the Bureau of Radiological Health, U.S. Department of Health, Education, and Welfare.

E. Career Potential

The overall career potential for existing professional occupations in the radiation control field is considered by experts to be extremely bright. Growth in the number of available new positions within the State Agencies has stabilized during the past two to three years. This

pattern is expected to continue. The State Agencies are not currently considering expansion of the environmental aspect of the radiation control program. As evidenced by the projected growth patterns, the major thrust in program expansion is in the X-ray program monitoring and licensing area. No growth is projected in the environmental surveillance staff.

The private sector will experience an average annual growth in workforce requirements from 1% up to 15% depending on the type of occupation. The most consequential growth will be in the nuclear related disciplines. This anticipated growth is underscored by the fact that there are currently five operational nuclear power units in California. Seven additional units are planned. As these seven units become functional, there will be a steady growth in the demands for trained professionals with backgrounds in radiation technology and control.

F. Conclusion

Two conclusions may be made concerning the workforce projections for radiation control programs in the State of California:

- 1) that the career potential for professional occupations in the radiation technology and control field is extremely bright;
- 2) that the growth in private sector demands for personnel with training in radiation technology and control will steadily increase at an average rate of 5-19 percent during the next five years.

Training programs which educate health physicists and radiological health specialists have limited availability. Educational institutions have not extensively explored the feasibility of developing such programs. With the growth in demand for professionals in the radiation control field, educational institutions should explore the feasibility of developing such programs.

PUBLIC HEALTH DIVISION
ORGANIZATIONAL CHART

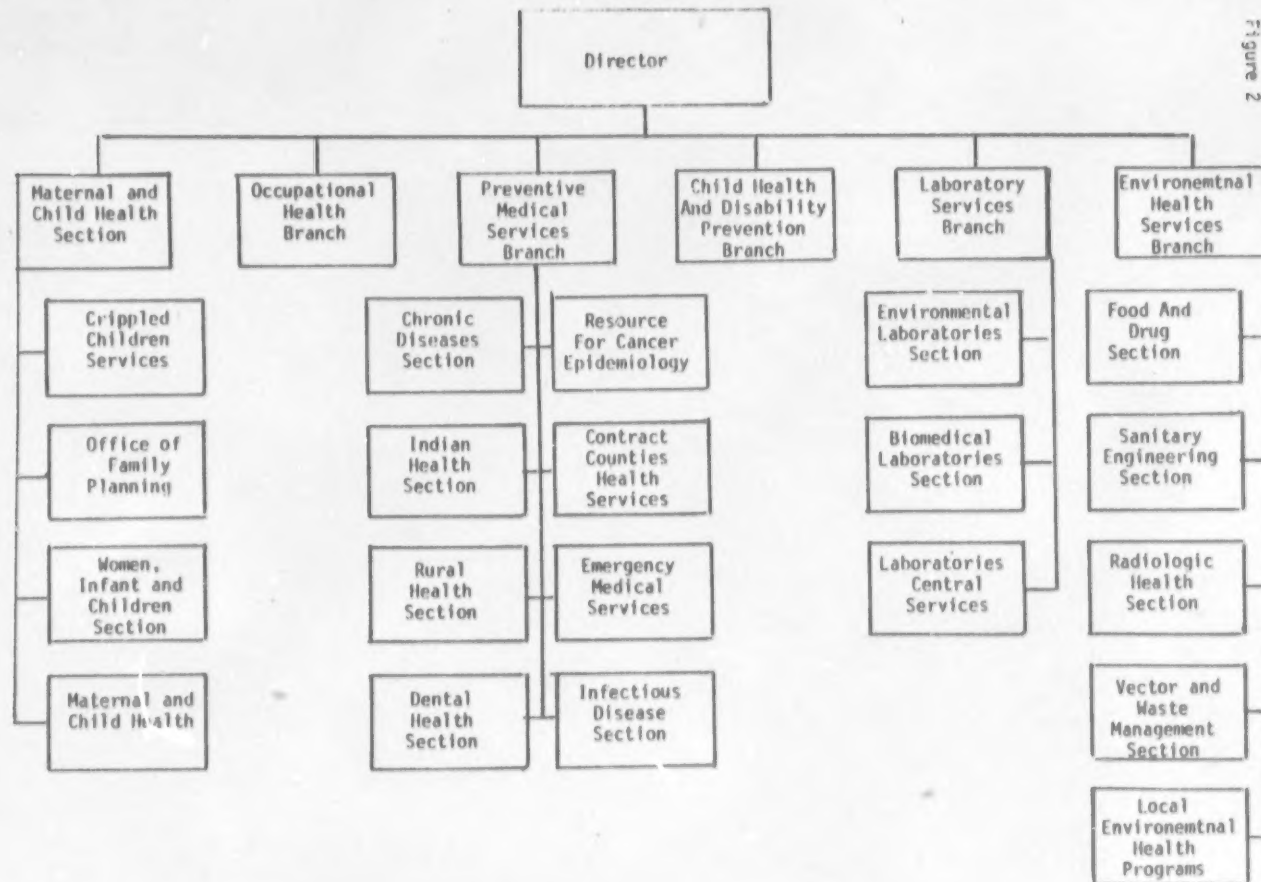


Figure 2

VI. SOLID WASTE

A. Introduction

Each year California accumulates twenty million tons of residential and commercial waste or approximately one ton per person per year. Thirty-five million tons of agricultural waste and fourteen million tons of industrial waste are also produced annually. Estimates indicate that about a quarter of the nine million tons of waste paper is recoverable and more than three million tons of waste metal and glass can be recycled.

In an attempt to effectively control the growing solid waste problem, the California Solid Waste Management Board was created in 1972. The Board was authorized by the Nejedly-Z'berg-Dills Solid Waste Management and Resource Recovery Act of 1972. This legislation recognized the need for a statewide program to establish and maintain a high standard of performance in the areas of collection, transfer, and disposal of solid wastes, and to emphasize resource recovery operations as a means of conserving natural resources.

The law directed the newly-formed Board to establish and maintain a comprehensive state solid waste management and resource recovery policy in concert with the environmental health protection programs of the State Department of Health. The objectives of the Board's programs are to assist and guide local solid waste operations toward greater protection of the public health, safety and well-being, enhance the environment by upgrading collection and disposal operations and maximize the reutilization and conversion of the material resources and energy presently contained in the solid waste stream.

The Nejedly-Z'berg-Dills Solid Waste Management and Resource Recovery Act is specific in its directions for the manner and mechanism to be used in the implementation of its objectives. California's 58 counties are given the responsibility of preparing individual Solid Waste Management Plans that have the concurrence of the majority of the cities with the majority of the population within the county. The State Board was mandated the following tasks:

- 1) establish statewide solid waste management policies;
- 2) adopt minimum standards;
- 3) develop planning guidelines upon which county solid waste management plans are based;
- 4) adopt a resource recovery program;
- 5) submit a report on improved methods of controlling and reducing the problem of litter;
- 6) study alternative methods of providing financial assistance to local agencies;
- 7) render technical assistance;
- 8) implement a public information program;
- 9) conduct and coordinate studies on new solid waste handling methods;
- 10) implement a statewide solid waste management information system.

In implementing these objectives, the Board provides technical assistance, information, training, and guidelines to the public and private sectors and to all local agencies in accordance with the legislative mandates and the policy and standards of the Board. It also provides leadership and assistance to local entities and private concerns toward resolution of the problems of litter in California.